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FINDINGS

How to keep a cat in limbo

Schrödinger's cat may be about to escape the atomic world for the first time. Physicists have designed an experiment to discover whether one of the great conundrums of quantum mechanics is possible at the macroscopic level.

The paradoxical theory of superposition, encapsulated by Erwin Schrödinger in his famous mind experiment involving a cat hovering between life and death, has long been held to be restricted to the smallest end of the size spectrum.

At this atomic scale, quantum mechanics predicts that something can demonstrably be in two places at the same time. In our more familiar macroscopic world, this seems impossible.

While physicists once argued about where the boundary between the two worlds might lie, the modern view is that such a divide does not exist, and that macroscopic things can, in theory, be forced to be in a superposition of being here and there simultaneously.

Demonstrating this has proved elusive, but now scientists Diego Dalvit, Jacek Dziarmaga and Wojciech Zurek, at the Los Alamos National Laboratory in the United States, might have come up with a way to do so.

The experiment, which is detailed in the journal *Physical Review*, will be a little more ethical than the hypothetical one originally proposed: Schrödinger considered shutting a cat in a box with a sealed flask of poisonous gas linked to an unstable atom. If the atom decays, the gas is released and the cat will die. Otherwise the cat lives.

In our macroscopic world, we would expect the box to contain either an unhappy, but alive, cat or the remains of an expired one. However, in the microscopic world of quantum mechanics, contrary to logic, the cat is in superposition of both alive and dead at the same time.

Dr Dalvit and his colleagues explained: "To find out if the cat is dead or alive, the observer has to interact with it in some way. However, when anyone interacts with the quantum system, it stops acting quantum: it can no longer exist in superposition. How long it takes to lose its superposition depends on how large it is — macroscopic cats are expected to lose their superposition much faster than microscopic objects."

In other words, the very act of opening the box means the cat is released from its limbo state and is then either alive or dead.

The scientists will test this theory on a large scale by using a new form of matter, a Bose-Einstein condensate. This can be made up of some 10 million atoms in the same quantum state at temperatures close to -273C and it can be forced into a superposition. This many atoms form something approaching the macroscopic level.

However, even at such extremely low temperatures, there are a few atoms around that will not be condensed — these can destroy the condensate's superposition by interacting with it.

To preserve the superposition for as long as possible, the scientists propose using a laser to stop the uncondensed atoms from interacting, so that they are unable to tell whether atoms are in one state or another.

We prefer our own smell

When it comes to body chemistry, how does our choice of perfume influence the signals we send out?

Manfred Milinski, at the Max Planck Institute in Germany, and Claus Wedekind, at the University of Bern, Switzerland, have been examining the link between our genetic make-up, which determines our own unique smell, and our choice of perfume.

Their research has focused on the MHC gene complex — part of our genome that plays an important role in controlling our immune system, as well as influencing our natural body odour. Previous work has suggested that "chemistry" is supposed to spark when we find a partner with an MHC complex that complements our own.

This is because offspring that inherit a different gene form coding for their MHC complex from each parent may be more resistant to disease than offspring that inherited two of the same type.

However, when the researchers asked people to rank their preference of between 18 and 36 different perfumes, both for themselves and their partner, they consistently chose scents for their own use that correlated with their own genetic make-up.

On the other hand, their genes did not have any influence on the scents they chose for their partner. The results suggest we really do choose perfume for ourselves.

Perfume ingredients are not single scents — the smell of a rose, for example, consists of more than 400 different components of smell.

The researchers are now testing the findings by trying to identify which components are the key scents and whether the extra components may be masking information about odours we prefer for our partners.

Nappy the key to diabetic pill

Most patients suffering from diabetes would prefer a pill